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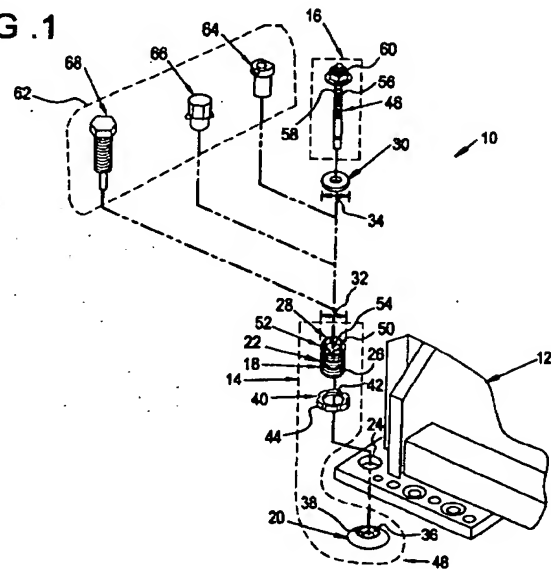
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(54) Leveling and securing apparatus

(57) An apparatus for securing and leveling equipment is described. The apparatus includes an anchor bolt (46) installed through a center of an aligning device (14). Vertical and lateral adjustments of the equipment are facilitated. The aligning device (14) includes a hollow adjuster (18) that is threaded within the equipment to raise or lower the equipment. The anchor bolt (46) has clearance for lateral motion within the aligning device (14) and the adjuster (18) is able to tilt at a spherical joint connection (38) with a leveling pad (20). The location of the anchor assembly in the center of the aligning device (14) facilitates leveling and alignment of the anchored equipment without causing distortion of the equipment and without the use of spacers.

FIG. 1



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Description

[0001] This invention relates generally to leveling apparatuses and, more particularly, to an apparatus for securing and leveling equipment and machinery.

[0002] Equipment often must be secured to a floor or wall for stability, for seismic reasons or for maintaining alignment with other equipment. In addition to anchoring, some equipment requires adjustment during or after field installation, for instance, to level the equipment or to align the equipment with other equipment.

[0003] It is common to align or level equipment using adjusters installed adjacent the equipment anchors. Adjustment in this manner, however, applies torque to the equipment relative to the anchoring. Such torque could distort the equipment. Although spacers or shims are commonly used to control distortion, the exact height of the appropriate spacer or shim is not known before the need for it has arisen. Therefore, a large variety of spacers or shims is kept in inventory.

[0004] Accordingly, it would be desirable to eliminate the distortion of anchored equipment resulting from leveling or alignment. It also would be desirable to level or align equipment without having to maintain spacers or shims in inventory.

[0005] In one exemplary embodiment of the present invention, a leveling and securing apparatus includes an anchor bolt installed through a center of an aligning device and into a floor. The aligning device includes a hollow adjuster threaded through a section or extension of the equipment. The aligning device also includes a leveling pad positioned on the floor and on which the adjuster rests. The adjuster and leveling pad contact each other with matched spherical surfaces. The anchor bolt is installed through the adjuster and leveling pad and has clearance for lateral motion within the aligning device. The equipment is raised or lowered by threading the adjuster up or down within the equipment. Lateral adjustment of the equipment is facilitated by the freedom of the anchor bolt to move laterally within the aligning device and leveling pad.

[0006] The above described leveling and securing apparatus facilitates leveling of equipment without spacers or shims. Also, due to the location of the anchor bolt in the center of the aligning device, anchored equipment is leveled and aligned without distortion of the equipment.

[0007] The invention will now be described in greater detail by way of example, with reference to the drawings in which:

Figure 1 is an exploded perspective view of one embodiment of a leveling and securing apparatus according to the present invention.

Figure 2 is an elevational view of the leveling and securing apparatus illustrated in Figure 1.

[0008] In one embodiment and as shown in Figure 1, an apparatus 10 for leveling and securing an object or equipment 12 includes an aligning device 14 and an anchor assembly 16 that extends coaxially within aligning device 14. Aligning device 14 includes a hollow adjuster 18 and a leveling pad 20. Adjuster 18 includes a threaded outer surface 22 extending through a threaded opening 24 in equipment 12. Adjuster 18 also includes a beveled bottom 26 and an upper ring of projections 28. A washer 30 rests upon, but is not attached to, upper ring of projections 28. Upper ring of projections 28 includes a projection ring diameter 32 and washer 30 includes a washer diameter 34 that is larger than projection ring diameter 32. Leveling pad 20 is flat-bottomed, annular and includes a central depression 36, into which beveled bottom 26 of adjuster 18 fits to form a spherical joint 38. Aligning device 14 also includes a lock ring 40 including a threaded inner surface 42 that is threaded upon threaded outer surface 22 of adjuster 18. Lock ring 40 also includes a grooved outer surface 44.

[0009] Anchor assembly 16 includes an anchor bolt 46 that extends through washer 30, adjuster 18 and leveling pad 20 into a floor or anchoring surface 48. Aligning device 14 includes an interior surface 50 that defines a passage 52 through aligning device 14 and through which anchor bolt 46 extends. Passage 52 has a passage diameter 54 and anchor bolt 46 has a bolt diameter 56 that is smaller than passage diameter 54. Anchor bolt 46 includes a threaded upper portion 58 upon which a nut 60 is threaded. An installation kit 62 includes a drill bushing 64, an adjuster tool 66 and an alignment tool 68.

[0010] Referring to Figure 2, apparatus 10 is installed and used in the following manner. Leveling pad 20 is placed upon floor 48 and is centered at the location into which anchor bolt 46 is to be installed. Adjuster 18 is threaded through equipment 12 using adjuster tool 66 and is connected to leveling pad 20 at spherical joint 38. Drill bushing 64 is inserted into adjuster 18 to facilitate drilling a hole 70 into floor 48. Washer 30 is installed onto anchor bolt 46 and anchor bolt 46 is inserted through adjuster 18 and leveling pad 20 into floor 48. Nut 60 is threaded on anchor bolt threaded upper portion 58, and anchor assembly 16 is hammered into hole 70. Alignment tool 68 is useful for installation in a corner (not shown) of floor 48 or other location inaccessible to a drill (not shown) after equipment 12 has been put into place. Alignment tool 68 is inserted through adjuster 18 and is used to position equipment 12 over a pre-drilled hole (not shown) in floor 48 for installation of anchor assembly 16.

[0011] In use, apparatus 10 allows equipment 12 to be adjusted both vertically and laterally. Vertical adjustment is accomplished by threading adjuster 18 up or down within equipment 12. A spanner wrench (not shown) is applied to upper ring of projections 28 to raise or lower adjuster 18. After vertical adjustment, lock ring

40 is threaded on the threaded outer surface 22 of adjuster 18 and into frictional contact with equipment 12 to maintain adjuster 18 and equipment 12 in their adjusted relative positions. Lock ring 40 is positioned by applying a spanner wrench (not shown) to grooved outer surface 44. Lateral adjustment is facilitated in two ways. Because passage diameter 54 is larger than bolt diameter 56, a degree of lateral movement of equipment 12 is facilitated by the loose fit of anchor bolt 46 within passage 52. Also, spherical joint 38 permits tilting of leveling pad 20 relative to adjuster 18 and equipment 12, thus allowing equipment 12 to be leveled where floor 48 is non-level. Washer 30 moves laterally with anchor assembly 16 while maintaining anchor assembly 16 at the desired vertical location relative to adjuster 18 and hole 70.

[0012] For the sake of good order, various features of the invention are set out in the following clauses:-

1. A method for securing and leveling an object utilizing at least one leveling and securing apparatus including an anchor assembly and an aligning device, the aligning device including an adjuster and a leveling pad configured to be connected to each other by a spherical joint, the aligning device further including an interior surface defining a passage through the adjuster and the leveling pad, the anchor assembly including an anchor bolt for installation through the passage and into an anchoring surface, said method comprising the steps of:

connecting the leveling and securing apparatus to the object;

placing the object in position to be secured;

installing the anchor bolt through the passage of the aligning device and into the anchoring surface; and

adjusting the location of the object.

2. A method in accordance with Clause 1 wherein the step of connecting the leveling and securing apparatus to the object comprises the step of connecting the adjuster to the object.

3. A method in accordance with Clause 2 wherein the adjuster includes a threaded outer surface and the step of connecting the adjuster to the object comprises the step of threadedly connecting the adjuster to the object.

4. A method in accordance with Clause 3 wherein the step of threadedly connecting the adjuster to the object comprises the step of threading the adjuster through the object.

5. A method in accordance with Clause 4 wherein the step of threading the adjuster through the object comprises threading the adjuster through the object using an adjuster tool.

6. A method in accordance with Clause 1 wherein the step of placing the object in position to be secured comprises the steps of:

placing the leveling pad on the anchoring surface; and

resting the adjuster on the leveling pad at the spherical joint.

7. A method in accordance with Clause 1 wherein the step of placing the object in position to be secured comprises the step of inserting an alignment tool through the adjuster and into a pre-drilled hole in the anchoring surface.

8. A method in accordance with Clause 1 wherein the step of installing the anchor bolt through the passage of the aligning device and into the anchoring surface comprises the step of drilling a hole into the anchoring surface using a drill bushing inserted into the adjuster.

9. A method in accordance with Clause 1 wherein the step of adjusting the location of the object comprises the step of adjusting the adjuster relative to the object.

10. A method in accordance with Clause 9 wherein the adjuster includes a threaded outer surface and the aligning device includes a lock ring including a threaded inner surface, and the step of adjusting the adjuster relative to the object comprises the steps of:

threading the adjuster relative to the object; and

threadedly engaging the lock ring on the adjuster threaded outer surface to immobilize the adjuster relative to the object.

11. A method in accordance with Clause 1 wherein the passage through the aligning device allows for movement of the anchor bolt within the passage and the step of adjusting the location of the object comprises the step of moving the object in a direction approximately parallel to the anchoring surface.

12. An apparatus for securing and leveling equipment, said apparatus comprising:

an aligning device comprising an adjuster con-

connected to the equipment, a leveling pad positioned on an anchoring surface and resting on said adjuster at a spherical joint, said adjuster and said leveling pad together comprising an aligning device interior surface defining a passage through said aligning device; and

an anchor assembly comprising an anchor bolt extending through said passage.

13. An apparatus in accordance with Clause 12 wherein said adjuster comprises a threaded outer surface for threadedly interacting with the equipment.

14. An apparatus in accordance with Clause 13 wherein said aligning device further comprises a lock ring comprising a threaded inner surface for threadedly engaging said threaded outer surface of said adjuster.

15. An apparatus in accordance with Clause 14 wherein said lock ring further comprises a grooved outer surface.

16. An apparatus in accordance with Clause 12 wherein said anchor bolt comprises a bolt diameter and said aligning device interior surface defines a passage diameter greater than said bolt diameter, said passage diameter thereby allowing said anchor bolt to move within said passage.

17. An apparatus in accordance with Clause 16 wherein said adjuster further comprises an upper ring of projections having a projection ring diameter, and said apparatus further comprises at least one washer mounted for movement with said anchor assembly and having a washer diameter larger than said projection ring diameter, said anchor bolt positioned through said washer and upper ring of projections.

18. An apparatus in accordance with Clause 17 wherein said anchor bolt further comprises a threaded upper portion threadedly engaged by a nut for adjusting said anchor bolt relative to said aligning device and the anchoring surface.

19. An apparatus in accordance with Clause 12 further comprising a drill bushing, an adjuster tool and an alignment tool.

20. An apparatus in accordance with Clause 12 wherein said spherical joint between said adjuster and said leveling pad permits tilting of said leveling pad relative to said adjuster and relative to the equipment, for leveling the equipment on a non-level floor surface.

Claims

1. A method for securing and leveling an object utilizing at least one leveling and securing apparatus including an anchor assembly and an aligning device, the aligning device including an adjuster and a leveling pad configured to be connected to each other by a spherical joint, the aligning device further including an interior surface defining a passage through the adjuster and the leveling pad, the anchor assembly including an anchor bolt for installation through the passage and into an anchoring surface, said method comprising the steps of:

connecting the leveling and securing apparatus to the object;

placing the object in position to be secured;

installing the anchor bolt through the passage of the aligning device and into the anchoring surface; and

adjusting the location of the object.

2. A method in accordance with Claim 1 wherein the step of connecting the leveling and securing apparatus to the object comprises the step of connecting the adjuster to the object.

3. A method in accordance with Claim 2 wherein the adjuster includes a threaded outer surface and the step of connecting the adjuster to the object comprises the step of threadedly connecting the adjuster to the object.

4. A method in accordance with Claim 3 wherein the step of threadedly connecting the adjuster to the object comprises the step of threading the adjuster through the object.

5. A method in accordance with Claim 4 wherein the step of threading the adjuster through the object comprises threading the adjuster through the object using an adjuster tool.

6. An apparatus for securing and leveling equipment, said apparatus comprising:

an aligning device comprising an adjuster connected to the equipment, a leveling pad positioned on an anchoring surface and resting on said adjuster at a spherical joint, said adjuster and said leveling pad together comprising an aligning device interior surface defining a passage through said aligning device; and

an anchor assembly comprising an anchor bolt

extending through said passage.

7. An apparatus in accordance with Claim 6 wherein said adjuster comprises a threaded outer surface for threadedly interacting with the equipment. 5
8. An apparatus in accordance with Claim 6 or 7 wherein said aligning device further comprises a lock ring comprising a threaded inner surface for threadedly engaging said threaded outer surface of said adjuster. 10
9. An apparatus in accordance with Claim 8 wherein said lock ring further comprises a grooved outer surface. 15
10. An apparatus in accordance with any one of Claims 6 to 9 wherein said anchor bolt comprises a bolt diameter and said aligning device interior surface defines a passage diameter greater than said bolt diameter, said passage diameter thereby allowing said anchor bolt to move within said passage. 20

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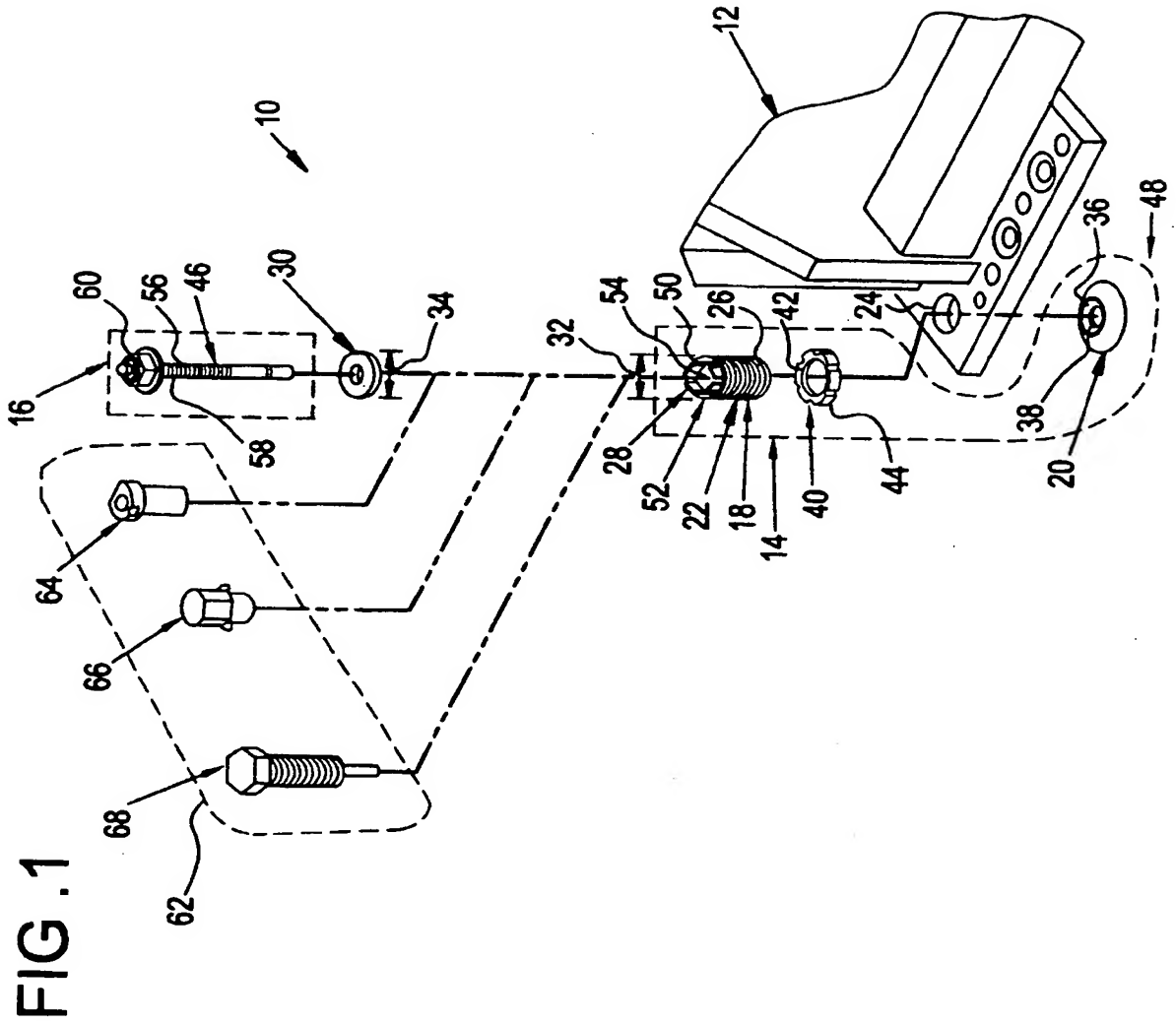
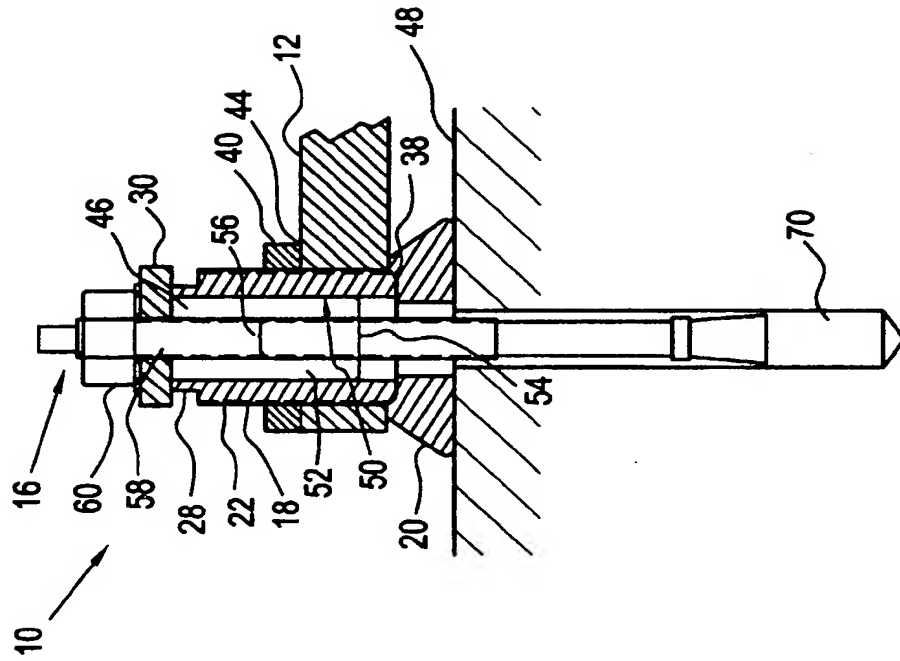


FIG. 2





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EUROPEAN SEARCH REPORT

Application Number
EP 00 30 7199

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.CI.7)
X	US 5 511 760 A (KAMBARA GORO) 30 April 1996 (1996-04-30) * column 3, line 48 - column 4, line 19 * * column 5, line 55 - column 6, line 9; figures 2A,8 *	1-7,10	F16M7/00
X	DE 24 05 368 A (GEMEX GMBH & CO KG) 7 August 1975 (1975-08-07) * page 14, line 1 - line 16; figure 4 *	1-10	
A	US 3 361 410 A (MESSER HANS J) 2 January 1968 (1968-01-02) * column 2, line 47 - column 3, line 7; figure 1 *	1	
X		6,7,10	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.CI.7) F16M
Place of search THE HAGUE		Date of completion of the search 13 December 2000	Examiner Baron, C
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 30 7199

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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13-12-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5511760 A	30-04-1996	NONE	
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EPO FORM P0489

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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